

-- REMARKS --

The present amendment replies to an Office Action dated August 6, 2008. Claims 1-20 are pending in the present application. Claims 1, 2, 18, and 20 have been amended and claims 21 and 22 added herein. In the Office Action, the Examiner rejected claims 1-20 on various grounds. The Applicants respond to each ground of rejection as subsequently recited herein and request reconsideration of the present application.

Drawing Objections

The Examiner objected to the drawings under 37 CFR 1.83(a) for failing to show every feature in the claims, particularly, a bonding layer between the substrate and the via. Claims 2 and 20 have been amended herein to recite a bonding layer between said substrate and said heatsink as illustrated at least in Figure 2. Withdrawal of the objection to the drawings is respectfully requested.

Claim Objections

The Examiner objected to claims 2 and 20 as reciting a bonding layer, which is not between the substrate and the via. Claims 2 and 20 have been amended herein to recite a bonding layer between said substrate and said heatsink. Withdrawal of the objection to claims 2 and 20 is respectfully requested.

35 U.S.C. §103 Rejections

Obviousness is a question of law, based on the factual inquiries of 1) determining the scope and content of the prior art; 2) ascertaining the differences between the claimed invention and the prior art; and 3) resolving the level of ordinary skill in the pertinent art. *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). See MPEP 2143.03. The Applicants respectfully assert that the cited references fail to teach or suggest all the claim limitations.

A. Claims 1-7 and 12-13 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent No. 6,477,054 to Hagerup (the *Hagerup* patent).

The Applicants respectfully assert that the *Hagerup* patent fails to disclose, teach, or suggest each and every element of the Applicants' invention as claimed, as required to maintain a rejection under 35 U.S.C. §103(a). The Applicants assert that the *Hagerup* patent fails to disclose, teach, or suggest:

A device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED, as recited in independent claim 1; or

A device for thermal management of an LED including a flexible substrate in thermal communication with said trace layer and said heatsink, as recited in independent claim 12.

Regarding independent claim 1, the *Hagerup* patent at most discloses that the top surface of the first dielectric layer 12 has a first conductive pattern 16 formed thereon. A second conductive element 22 is formed on the top surface of the first dielectric layer 12 and functions as a voltage potential lead for an integrated circuit device 24. Positioned below the first conductive pattern 16 is a second conductive pattern 26. The second conductive pattern 26 functions as the second plate of the capacitor 20 and as a thermally conductive heat transfer layer for the integrated circuit device 24. See Figures 3 and 4; column 3, lines 22-45. Thus, the *Hagerup* patent discloses a first dielectric layer 12 between the second conductive pattern 26 and the second conductive element 22, and not a pad overlying and adjacent to said trace layer overlying and adjacent to said substrate as claimed.

Regarding independent claim 12, the *Hagerup* patent at most discloses a low temperature co-fired ceramic (LTCC) substrate structure. The substrate structure 10 is preferably implemented using Dupont 951 LTCC material but other LTCC material having similar characteristics to the Dupont 951 material may equally be used in the present invention.

See Abstract; column 3, lines 12-21. The Applicants assert that LTCC substrate is not flexible, but is a rigid ceramic in its final, usable state. U.S. Patent No. 7,155,812 to Peterson, *et al.*, cited herein as a reference, explains at column 1, lines 28-41:

LTCC is generally defined as a family of glass-ceramic dielectric substrate materials that are flexible and formable in the 'green' unfired state, and *become rigid upon firing* at temperatures below 1000 °C. Such dielectric materials are widely used in the art and are supplied as flexible green sheets or tapes. Conductors, resistors, via fills, inductive and capacitive structures are incorporated in or printed on the LTCC dielectrics using compatible inks or pastes by processes well known in the art. These materials and recommended processing methods are well known and available commercially from Electro-Science Laboratories, INC, King of Prussia, Pa., *the DuPont Company*, Wilmington, Del. and Ferro Corporation of Cleveland, Ohio, among others. (*Emphasis added.*)

While LTCC is flexible during fabrication, the final product is rigid after firing. The *Hagerup* patent explicitly mentions using Dupont 951 LTCC material or the like. Therefore, the *Hagerup* patent fails to disclose a flexible substrate as claimed.

Claims 2-7 and claim 13 depend directly or indirectly from independent claims 1 and 12, respectively, and so include all the elements and limitations of their respective independent claims. The Applicants therefore respectfully submit that dependent claims 2-7 and 13 are allowable over the *Hagerup* patent for at least the same reasons as set forth above for their respective independent claims.

Regarding dependent claims 2-4, the Applicants respectfully submit that element 42 as cited by the Examiner is a third conductive pattern 42 on the bottom surface of the second dielectric layer, and is not a bonding layer as claimed. See Figure 4; column 4, lines 21-23.

Regarding dependent claim 3, the Applicants respectfully submit that the *Hagerup* patent fails to disclose an adhesive or a thermally conductive adhesive.

Regarding dependent claim 4, the Applicants respectfully submit that the LTCC tape as cited by the Examiner at column 1, lines 40-49, is a portion of the substrate and not a bonding layer as claimed.

Regarding dependent claim 6, the Applicants respectfully submit that the form of the rejection is improper as the Examiner is citing the teaching of another patent outside of the *Hagerup* patent.

Regarding dependent claim 6, the Applicants respectfully submit that the LTCC tape cited by the Examiner is not flexible, but is rigid as discussed above for independent claim 12.

Withdrawal of the rejection of claims 1-7 and 12-13 under 35 U.S.C. §103(a) is respectfully requested.

B. Claims 8-11 and 14-20 were rejected under 35 U.S.C. §103(a) as being unpatentable over the *Hagerup* patent in view of U.S. Patent No. 7,054,159 to Nakamura (the *Nakamura* patent).

The Applicants respectfully assert that the *Hagerup* patent and the *Nakamura* patent, alone or in combination, fail to disclose, teach, or suggest each and every element of the Applicants' invention as claimed, as required to maintain a rejection under 35 U.S.C. §103(a). As discussed in Section A above, the Applicants assert that the *Hagerup* patent fails to disclose, teach, or suggest:

A device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED, as recited in independent claim 1; or

A device for thermal management of an LED including a flexible substrate in thermal communication with said trace layer and said heatsink, as recited in independent claim 12.

The *Hagerup* patent also fails to disclose, teach, or suggest:

A device for thermal management of an LED including a trace layer overlying and adjacent to said substrate; and a pad overlying and adjacent to said trace layer, said pad being operable to mount said LED, as recited in independent claim 18.

Regarding independent claim 18, the *Hagerup* patent at most discloses that the top surface of the first dielectric layer 12 has a first conductive pattern 16 formed thereon. A second conductive element 22 is formed on the top surface of the first dielectric layer 12 and functions as a voltage potential lead for an integrated circuit device 24. Positioned below the first conductive pattern 16 is a second conductive pattern 26. The second conductive pattern 26 functions as the second plate of the capacitor 20 and as a thermally conductive heat transfer layer for the integrated circuit device 24. *See* Figures 3 and 4; column 3, lines 22-45. Thus, the *Hagerup* patent discloses a first dielectric layer 12 between the second conductive pattern 26 and the second conductive element 22, and not a pad overlying and adjacent to said trace layer overlying and adjacent to said substrate as claimed.

The *Nakamura* patent also fails to disclose these limitations as recited in independent claims 1, 12, and 18.

Claims 2-7 and claim 13 depend directly or indirectly from independent claims 1 and 12, respectively, and so include all the elements and limitations of their respective independent claims. The Applicants therefore respectfully submit that dependent claims 2-7 and 13 are allowable over the *Hagerup* patent for at least the same reasons as set forth above for their respective independent claims.

Regarding dependent claims 9, 11, 15, 17, and 19, the *Hagerup* patent and the *Nakamura* patent fail to disclose a thermal conductive material filling at least a portion of said channel as claimed. At most, the *Nakamura* patent discloses copper foil 5a formed on the inner wall of each of the holes 21, but fails to disclose thermal conductive material in the channel formed by the copper foil 5a. *See* Figure 2; column 4, lines 21-23.

Regarding dependent claim 20, the Applicants respectfully submit that element 42 of the *Hagerup* patent as cited by the Examiner is a third conductive pattern 42 on the bottom surface of the second dielectric layer, and is not a bonding layer as claimed. *See* Figure 4; column 5, lines 44-55.

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Withdrawal of the rejection of claims 8-11 and 14-20 under 35 U.S.C. §103(a) is respectfully requested.

New Claims

Claims 21-22 have been added herein to more particularly point out and distinctly claim the Applicants' invention. Claims 21-22 are allowable over the cited references for at least the reasons discussed above for their respective independent claim 1. No new matter has been added with the inclusion of claims 21-22, which are supported in the specification at least on pages 5 and 6.

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SUMMARY

Reconsideration of the rejection of claims 1-20 and consideration of claims 21-22 is requested. The Applicants respectfully submit that claims 1-22 fully satisfy the requirements of 35 U.S.C. §§102, 103, and 112. In view of the foregoing, favorable consideration and early passage to issue of the present application is respectfully requested.

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Respectfully submitted,
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